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Myopia: Inevitable Epidemic or Preventable Condition?

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Abstract: ***This cross sectional observational study examined the incidence of myopia among 362 school children aged 12 to 18 years in a residential school setting and explored its variation across age and gender along with its association with study habits and outdoor activity. Screening conducted in December 2025 identified an overall myopia incidence of 5.24 percent, with higher occurrence noted at younger entry levels and lower rates in senior classes. Mild refractive error was most common among newly diagnosed cases, while severe forms were absent. Gender differences were minimal, though isolated variations were observed in specific age groups. The findings align with existing evidence linking increased outdoor exposure with reduced myopia risk, supported by biological mechanisms related to light induced retinal responses. The controlled school environment with structured schedules, limited screen exposure, and regular outdoor activities appears to contribute to healthier visual outcomes. The study highlights the role of modifiable lifestyle factors within school systems and suggests that integrating outdoor time and balanced routines may help manage the growing burden of pediatric myopia, while also noting the need for further longitudinal research in adolescent populations.***

Keywords: myopia in children, school environment, outdoor activity, study habits, refractive error

1. Introduction

Objectives:

- To determine the incidence of myopia in school aged children in controlled environment.

Secondary Objectives:

- To assess variation in incidence across age groups and gender
- To evaluate correlation between myopia and study habits and outdoor activity.

Methodology

- Study design: Cross sectional observational study
- Study population: children aged 12-18 years enrolled at school
- Study setting: Jawahar Navodaya Vidyalaya, Uduvalli (Residential school)
- Sample size: **362**
- Conducted in December 2025

Inclusion Criteria:

- Students aged between 12-18 years
- Consent from school authorities

Exclusion Criteria:

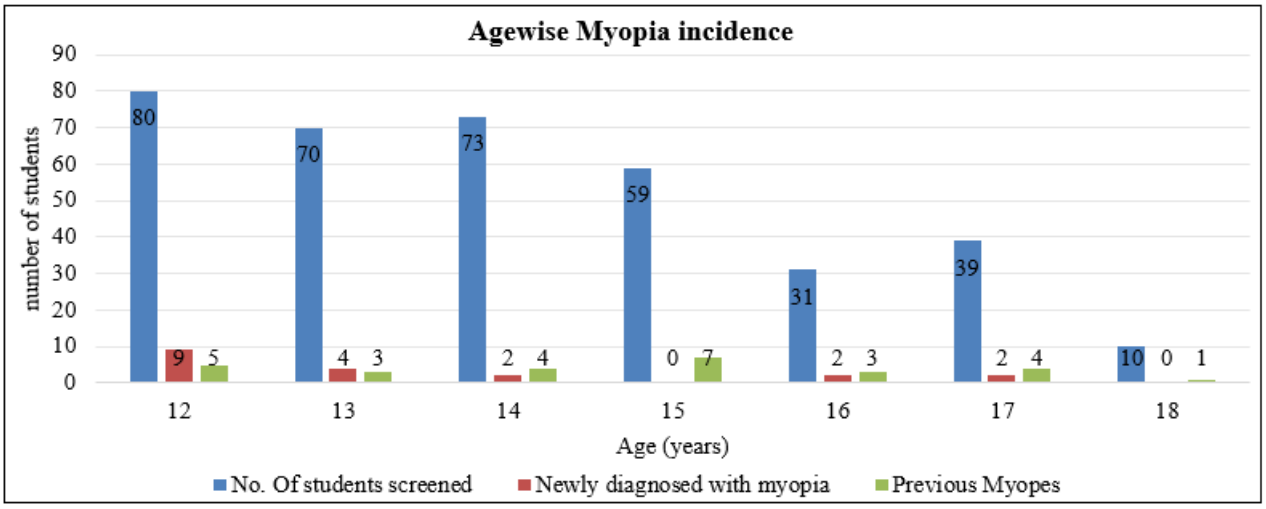
- Children absent during screening.

2. Results:

1) AGEWISE:

Overall incidence of myopia: **5.24%**

Age (years)	No. of students screened	Newly diagnosed with myopia	Previous Myopes	Age wise incidence
12	80	9	5	12%
13	70	4	3	5.97%
14	73	2	4	2.89%
15	59	0	7	0%
16	31	2	3	7.14%
17	39	2	4	5.71%
18	10	0	1	0%

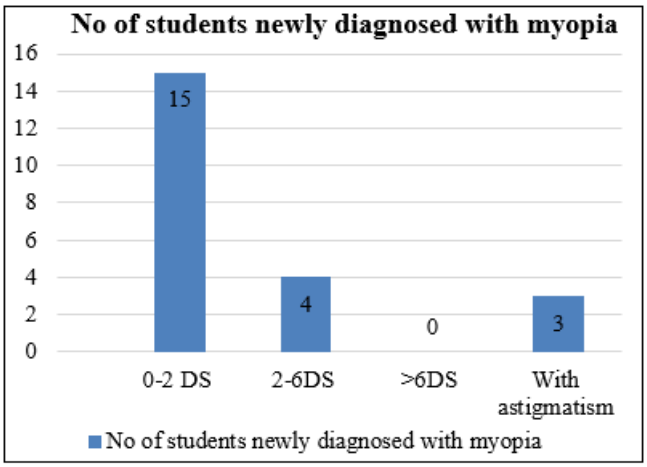


2) GENDERWISE:

Age (years)	No of males diagnosed	No of females diagnosed	Incidence in males	Incidence in females
12	5	4	12.82%	11.42%
13	3	1	7.89%	3.44%
14	1	1	2.63%	3.33%
15	0	0	0	0
16	0	2	0	7.14%
17	1	1	10%.1%	4%
18	0	0	0	0

3) Severity of Myopia:

Interval of refractive error	No of students newly diagnosed
0-2 DS	15
2-6DS	4
>6DS	0
With astigmatism	3



4) Colour Vision:
Abnormal Colour Vision in 4 boys.

3. Discussion

The present findings support the growing body of evidence that structured school environments incorporating regulated outdoor exposure are associated with a reduced incidence of myopia among children aged 12–18 years. In recent decades, the global prevalence of pediatric myopia has increased substantially, particularly in Asian populations, highlighting the importance of modifiable environmental determinants in refractive development[1],[2].

Environmental influences, especially time spent outdoors, have consistently demonstrated a protective association against myopia onset. A meta-analysis by Xiong et al.[1] reported a significant inverse relationship between outdoor activity and incident myopia, demonstrating a dose–response effect. Similarly, Sherwin et al.[8] confirmed that increased time outdoors was associated with lower odds of developing myopia in children and adolescents. These findings are biologically plausible and supported by experimental data suggesting that high ambient light intensity stimulates retinal dopamine release, thereby inhibiting axial elongation[2].

School-based interventional studies further strengthen this association. Wu et al.[3] demonstrated that mandatory outdoor recess in Taiwanese schoolchildren significantly reduced the onset of myopia over a one-year period. In a large randomized clinical trial, He et al.[4] showed that the addition of 40 minutes of outdoor activity per school day reduced cumulative myopia incidence over three years. These findings are particularly relevant for structured or "closed" educational settings, where daily schedules can be modified to incorporate preventive strategies.[6]

Within the Indian context, the burden of pediatric refractive error is substantial and rising. The Refractive Error Study in Children (RESC) conducted in urban Delhi reported a myopia prevalence of 7.4% among schoolchildren aged 5–15 years[9]. More recent Indian school-based data also indicate increasing myopia prevalence in urban populations, with environmental factors such as prolonged near work and limited outdoor exposure implicated as contributory factors[10]. These findings underscore the relevance of preventive environmental interventions in Indian school systems, particularly in urbanized regions where academic pressures and indoor lifestyles predominate.

Incidence is more in 6th standard children who have just joined the school indicating increased screen time, decreased outdoor activity and lack of nutritious food- all these factors might have added cumulatively. Surprisingly its very low in 10th and 12th standard students who are doing more near work, this again underscores the overall importance of decreased screen time and increased outdoor activity time to have good vision.

Beyond duration of outdoor activity, environmental design may also influence refractive outcomes. Exposure to green spaces within school premises has been associated with lower odds of myopia onset[5], suggesting that school infrastructure planning may represent a complementary preventive approach.

The 12–18-year age group represents a critical window for myopia onset and progression, coinciding with increasing academic demands and screen exposure. Huang et al.[7] demonstrated a positive association between near work and myopia, reinforcing the importance of balancing near tasks with distance viewing. Structured school policies that mandate outdoor breaks, limit prolonged uninterrupted near work, and encourage visual hygiene practices may therefore contribute meaningfully to myopia risk reduction.

4. Conclusion

Our findings indicate a comparatively lower myopia burden in the studied 10–16-year age group, which may be attributed to structured scheduling of outdoor activities, reduced recreational screen exposure, and adherence to a balanced, nutritious diet within the school environment. These modifiable lifestyle factors likely contribute to healthier visual development during a critical period of refractive change. In the context of rising pediatric myopia prevalence globally and within urban India, our results highlight the protective value of regulated outdoor time combined with healthy behavioral practices. Such integrated, school-based preventive strategies may represent a practical and sustainable approach to myopia risk reduction

5. Limitations

Although substantial evidence supports the protective effect of outdoor exposure, most interventional studies have focused on primary school-aged children. Longitudinal studies specifically examining early and mid-adolescents (10–16 years) are limited. Additionally, standardized quantification of outdoor light exposure, axial length progression, and pubertal influences warrants further investigation. Multicentric prospective interventional studies in Indian populations would be particularly valuable in establishing context-specific preventive guidelines.

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